What is claimed is:

1. A method for routing a liquid comprising the steps of:

receiving said liquid on a patterned surface comprising one or more pathways; and

individually activating one or more heating elements,

wherein said heating elements are in registry with said patterned surface for selectively heating said patterned surface under conditions effective for routing said liquid on said patterned surface.

2. The method of claim 1 wherein each of said one or more pathways connect a source reservoir to a target reservoir.

3. The method of claim 1 comprising a plurality of pathways, each of said pathways connect a source reservoir to a target reservoir.

4. The method of claim 1 wherein said pathways form a network including a first plurality of said pathways each having a source reservoir and a target reservoir and a second plurality of said pathways each having a source reservoir and a target reservoir, said first plurality of pathways being interconnected to said second plurality of pathways.

5. The method of claim 1 further comprising a plurality of first said pathways connected perpendicularly to a second pathway, each of said first pathways and said second pathway having a source reservoir and a target reservoir.

6. The method of claim 1 wherein a plurality of said pathways are arranged radially from a source reservoir to a plurality of target reservoirs or radially from a plurality of source reservoirs to a target reservoir.

7. The method of claim 1 wherein said pathways are rectilinear.

8. The method of claim 1 wherein said pathways are curvilinear.

9. The method of claim 1 wherein said pathways are sinuous.

10. The method of claim 1 wherein each of said heating elements are associated with a cell, said cell including at least one transistor, said transistor being activated for activating said heating element of said cell.

11. The method of claim 10 wherein said cells are arranged in a matrix array.

12. The method of claim 10 wherein each of said one or more pathways connects a source reservoir to a target reservoir and one said heating elements is used for heating

or cooling said source reservoir and one or more said heating elements are used for preventing or promoting migration of said liquid along said one or more pathways.

13. The method of claim 1 wherein said patterned surface is formed on a substrate and said heating elements are associated in registry with said substrate.

14. The method of claim 13 wherein a thermal insulation layer is coupled to an upper surface of said substrate and a bottom surface of said one or more heating elements.

15. The method of claim 13 wherein an electrical insulation layer is coupled to an upper surface of said substrate and a bottom surface of said one or more heating elements.

16. The method of claim 13 wherein an electrical insulation layer is coupled to an upper surface of said one or more heating elements.

17. The method of claim 13 further comprising a passivation layer coupled to said substrate.

18. The method of claim 13 further comprising a planarization layer coupled to said one or more heating elements.

19. The method of claim 13 wherein said one or more heating elements are coupled to a first region of said substrate and a heat sink is coupled to a second region of said substrate.

20. The method of claim 1 wherein said activated one or more heating elements form a thermal map.

21. The method of claim 20 wherein said liquid is a continuous stream and activation of said thermal map divides said stream into a series of droplets.

22. The method of claim 21 wherein said droplets have equal size or unequal size.

23. The method of claim 20 wherein said liquid is one or more droplets and activation of a first said thermal map traps said one or more droplets.

24. The method of claim 20 wherein application of a second thermal map releases said trapped one or more droplets.

25. The method of claim 20 wherein activation of said thermal map initiates a reaction.

26. The method of claim 20 wherein activation of said thermal map quenches a reaction.

27. The method of claim 1 wherein said patterned surface comprises one or more hydrophobic portions confining a hydrophilic surface, wherein said liquid flows along said hydrophilic surface.

28. The method of claim 1 wherein a first said liquid is received in one of said pathways and a second said liquid is received in another of said pathways, said pathways being interconnected, wherein flow of said liquid in said pathways mixes said first said liquid and said second said liquid.

29. The method of claim 28 wherein first said one or more heating elements apply a thermal gradient transverse to said pathways.

30. The method of claim 28 wherein second said one or more heating elements apply a thermal gradient parallel to said pathways.

31. The method of claim 1 wherein an airborne material in gaseous, particulate or aerosol form is absorbed in said liquid and further comprising the step of:

detecting said absorbed material.

32. The method of claim 31 wherein said material is detected by fluorescence of said liquid upon contact with said material.

33. The method of claim 1 further comprising the step of:

storing said patterned surface in glycerol.

34. The method of claim 1 further comprising:

applying a layer of glycerol on said patterned surface.

35. The method of claim 27 further comprising:

applying a layer of glycerol on said hydrophilic surface.

36. A device for routing a liquid comprising:

a patterned surface receiving said liquid, said patterned surface comprising one or more pathways;

one or more heating elements in registry with said patterned surface; and

means for individually activating one or more of said one or more heating elements, to selectively heat said patterned surface under conditions effective for routing said liquid on said patterned surface.

37. The device of claim 36 wherein each of said pathways connect a source reservoir to a target reservoir.

38. The device of claim 36 further comprising a plurality of pathways, each of said pathways connect a source reservoir to a target reservoir.

39. The device of claim 36 wherein said pathways form a network including a first plurality of said pathways each having a source reservoir and a target reservoir and a second plurality of said pathways each having a source reservoir and a target reservoir, said first plurality of said pathways being interconnected to said second plurality of said pathways.

40. The device of claim 36 further comprising a plurality of first pathways connected perpendicularly to a second pathway, each of said first pathways and said second pathway having a source reservoir and a target reservoir.

41. The device of claim 36 wherein said pathways are arranged radially from a source reservoir to a plurality of target reservoirs or from a plurality of source reservoirs to a target reservoir.

42. The device of claim 36 wherein said pathways are rectilinear.

43. The device of claim 36 wherein said pathways are curvilinear.

44. The device of claim 36 wherein said pathways are sinuous.

45. The device of claim 36 wherein each of said heating elements are associated with a cell, said cell including at least one transistor, said transistor being activated for activating said heating element of said cell.

46. The device of claim 36 wherein said cells are arranged in a matrix array.

47. The device of claim 36 wherein each of said pathways connects a source reservoir to a target reservoir and one said heating element is used for heating or cooling said source reservoir and one or more of said heating elements are used for preventing or promoting migration of said liquid along said one or more pathways.

48. The device of claim 36 wherein said patterned surface is formed on a substrate and said heating elements are associated in registry with said substrate.

49. The device of claim 48 wherein a thermal insulation layer is coupled to an upper surface of said substrate and a bottom surface of said heating elements.

50. The device of claim 48 wherein an electrical insulation layer is coupled to an upper surface of said substrate and a bottom surface of said heating elements.

51. The device of claim 48 wherein an electrical insulation layer is coupled to an upper surface of said heating elements.

52. The device of claim 48 further comprising a passivation layer coupled to said substrate.

53. The device of claim 48 further comprising a planarization layer coupled to said one or more heating elements.

54. The device of claim 48 wherein said one or more heating elements are coupled to a first region of said substrate and a heat sink is coupled to a second region of said substrate.

55. The device of claim 48 wherein said activated one or more heating elements form a thermal map.

56. The device of claim 55 wherein said liquid is a continuous stream and activation of said thermal map divides said stream into an array of droplets.

57. The device of claim 56 wherein said droplets have equal size or unequal size.

58. The device of claim 55 wherein said liquid is one or more droplets and activation of said thermal map traps said one or more droplets.

59. The device of claim 58 wherein application of a second thermal map releases said trapped one or more droplets.

60. The device of claim 55 wherein activation of said thermal map initiates a reaction at one or more of said heating elements.

61. The device of claim 55 wherein activation of said thermal map quenches a reaction at said one or more heating elements.

62. The device of claim 36 wherein said patterned surface comprises one or more hydrophobic portions confining a hydrophilic surface, wherein said liquid flows along said hydrophilic surface.

63. The device of claim 36 wherein a first said liquid is received in one of said pathways and a second said liquid is received in another of said pathways, said pathways being interconnected wherein flow of said liquid in said pathways mixes said first said liquid and said second said liquid.

64. The device of claim 63 wherein first said one or more heating elements apply a thermal gradient transverse to said pathways.

65. The device of claim 63 wherein second said one or more heating elements apply a thermal gradient parallel to said pathway.

66. The device of claim 36 wherein an airborne material in gaseous, particulate or aerosol form is absorbed in said liquid and further comprising:

means for detecting said absorbed material.

67. The device of claim 66 wherein said material is detected by fluorescence of said liquid upon contact with said material.

68. A method for routing a liquid comprising the steps of:

receiving said liquid on a patterned surface, said patterned surface comprises one or more hydrophobic portions confining a hydrophilic surface to form a pathway; and

individually activating one or more heating elements,

wherein said heating elements are in registry with said patterned surface for selectively heating said patterned surface under conditions effective for routing said liquid along said hydrophilic surface.

69. A device for routing a liquid comprising:

a patterned surface receiving said liquid, said patterned surface comprising one or more hydrophobic portions confining a hydrophilic surface to form a pathway;

one or more heating elements in registry with said patterned surface; and

means for individually activating one or more of said one or more heating elements, for selectively heating of said patterned surface under conditions effective for routing said liquid along said hydrophilic surface.

70. A method for dividing a stream of liquid comprising the steps of:

receiving said stream of liquid on a patterned surface, said patterned surface comprises one or more hydrophobic portions confining a hydrophilic surface to form a pathway; and

individually activating one or more heating elements,

wherein said heating elements are in registry with said patterned surface for selectively heating said patterned surface under conditions effective for dividing said stream of liquid into one or more droplets.

71. A device for dividing a stream of a liquid comprising:

a patterned surface receiving said stream of liquid, said patterned surface comprising one or more hydrophobic portions confining a hydrophilic surface to form a pathway;

one or more heating elements in registry with said patterned surface; and

means for individually activating one or more of said one or more heating elements, for selectively heating of said patterned surface under conditions effective for dividing said stream of liquid into one or more droplets.

72. A method for mixing two or more liquids comprising the steps of:

receiving said two or more liquid, on a patterned surface, said patterned surface comprises one or more hydrophobic portions confining a hydrophilic surface to form a pathway, each of said liquids being received in one of said pathways, said pathways being interconnected; and

individually activating one or more heating elements,

wherein said heating elements are in registry with said patterned surface for selectively heating said patterned surface under conditions effective for mixing said two or more liquids in at least one of said pathways.

73. A device for mixing two or more liquids comprising:

a patterned surface, said patterned surface comprising one or more hydrophobic portions confining a hydrophilic surface to form a pathway, each of said liquids being received in one of said pathways, said pathways being interconnected;

one or more heating elements in registry with said patterned surface; and

means for individually activating one or more of said one or more heating elements, for selectively heating of said patterned surface under conditions effective for mixing said two or more liquids in at least one of said pathways.

74. A method for detecting an airborne material in gaseous, particulate or aerosol form comprising the steps of :

providing a device comprising a substrate having a network of one or more pathways on an upper surface of said substrate, each said one or more pathways extending between a pair of reservoirs, a heat source coupled to a bottom surface of said

substrate, a heat sink coupled to said bottom surface of said substrate opposite of said heat source;

applying a liquid to said network and allowing said liquid to flow by activation of said heating source;

applying said airborne material to said network; and

detecting said airborne material in said liquid.

75. The method of claim 74 wherein said heat source is positioned in registry with one or more source said reservoirs.

76. The method of claim 74 wherein said heat source comprises one or more heating elements.

77. The method of claim 74 wherein said airborne material is detected by liquid by becoming fluorescent.

78. The method of claim 74 wherein said airborne material is applied by a convective stream of said airborne material perpendicular to said one or more pathways.

79. A device for detecting an airborne material in gaseous, particulate or aerosol form comprising:

a substrate having a network of one or more pathways on an upper surface of said substrate, each said pathways extending between a pair of reservoirs, a heat source coupled to a bottom surface of said substrate, a heat sink coupled to said bottom surface of said substrate opposite of said heating source;

applying a liquid to said network and allowing said liquid to flow by activation of said heating source;

means for applying said airborne material to said network; and

means for detecting said airborne material in said liquid.

80. The device of claim 79 wherein said heat source is positioned in registry with one or more source said reservoirs.

81. The device of claim 79 wherein said heat source comprises one or more heating elements.

82. The device of claim 79 wherein said airborne material is detected by liquid by becoming fluorescent.

83. The device of claim 79 wherein said airborne material is applied by a convective stream of said airborne material perpendicular to one or more said pathways.

84. A method for fabricating a device for controlling flow of a liquid comprising the steps of:

a. optionally depositing a thermal and/or electrical insulator layer on said substrate;

b. depositing one or more heating elements on said substrate;

c. depositing a heater electrical insulator layer on said heating elements and said substrate or said thermal and/or electrical layer;

d. depositing a hydrophobic layer on said heater electrical insulator layer; and

e. patterning said hydrophobic layer to form one or more pathways for receiving flow of said liquid.

85. The method of claim 84 further comprising a step of cleaning said substrate as first step of said method.

86. The method of claim 84 wherein said heating elements comprise conductive leads and said heating elements are deposited by thermal evaporation.

87. The method of claim 84 wherein said heater electrical insulator layer is silicon oxide or spin-on glass.

88. The method of claim 84 wherein said hydrophobic layer is patterned by photolithography.

89. The method of claim 79 wherein step d is performed by the steps of:

evaporating a layer of Cr on said substrate;

evaporating a layer of Au on said layer of Cr;

spin coating photoresist on said layer of Au;

patterning said photorest;

etching a pattern into said layer of Au and said layer of Cr;

removing any remaining photoresist; and

coating said Au layer with said hydrophobic layer.

90. The method of claim 89 further comprising the steps of:

removing at least a portion of said hydrophobic or hydrophilic layer; and

refreshing said hydrophobic layer by immersing said substrate into a hydrophobic material.

91. The method of claim 90 wherein said hydrophobic material is an alkylthiol or fluorinated compound.

92. The method of claim 90 wherein said hydrophobic material is hexadecanethiol.

93. A method for forming a refreshable hydrophobic or hydrophilic surface comprising:

evaporating a layer of Cr on said substrate;

evaporating a layer of Au on said layer of Cr;

spin coating photoresist on said layer of Au;

patterning said photorest;

etching a pattern into said layer of Au and layer of Cr;

removing any remaining photoresist; and

coating said Au layer with a hydrophobic or hydrophilic material.

94. The method of claim 93 further comprising the steps of:

removing at least a portion of said hydrophobic or hydrophilic material; and

refreshing said hydrophobic or hydrophilic material by immersing said substrate into said hydrophobic or hydrophilic material.

95. The method of claim 93 wherein said hydrophobic material is an alkythiol.

96. The method of claim 93 wherein said hydrophobic material is hexadecanethiol.

97. The method of claim 93 further comprising a step of cleaning said substrate as a first step of said method.

98. A method for storing a device, said device comprising a device for detecting an airborne material in gaseous, particulate or aerosol form including a substrate having a network of one or more pathways on an upper surface of said substrate, each said pathways extending between a pair of reservoirs, a heat source coupled to a bottom surface of said substrate, a heat sink coupled to said bottom surface of said substrate opposite of said heating source,

comprising the step of:

storing said device in glycerol.

99. A method for storing a device, said device comprising a device for detecting an airborne material in gaseous, particulate or aerosol form including a substrate having a network of one or more pathways on an upper surface of said substrate, each said pathways extending between a pair of reservoirs, a heat source coupled to a bottom surface of said substrate, a heat sink coupled to said bottom surface of said substrate opposite of said heating source comprising the step of:

applying a layer of glycerol on said patterned surface.

100. A method of storing a substrate having a hydrophobic or a hydrophilic layer comprising the step of:

applying a layer of glycerol on said substrate on said hydrophobic or hydrophilic layer.

101. A method of storing a substrate having a hydrophobic or a hydrophilic layer comprising the step of:

storing said substrate in glycerol.